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Remarks

I.   Status of claims

Claims 1-68 are pending.

Claims 9, 18, 30, 37, and 61-63 have been rewritten in independent form in response to the Examiner's indication that such claims would be allowed. Claims 10-14 depend from independent claim 9 and therefore should be allowed for at least the same reasons. Claims 19-22 depend from independent claim 18 and therefore should be allowed for at least the same reasons. Claims 31-33 depend from independent claim 30 and therefore should be allowed for at least the same reasons. Claims 38-45 depend from independent claim 37 and therefore should be allowed for at least the same reasons.

The Examiner also has indicated that claims 51, 56, and 57 would be allowable if rewritten in independent form. Claims 52-54 also should be in condition for allowance since they depend from claim 51.

II.   Amendment to the specification

The specification has been amended to correct a typographical error in equation (9). In particular, the redness score R1 has been rewritten as the difference between the average pixel values APV_{R1} and APV_{R2}, instead of the difference between the areas $AR1$ and $AR2$ as originally written.

III.   Claim rejections

The Examiner has identified the following claims as being rejected under 35 U.S.C. § 102(e) over Schildkraut (U.S. 6,292,574): 1-8, 14-17, 20-21, 23-29, 31-36, 38, 42-44, 46-50, 52-55, 58-60, and 64-68.

As mentioned above, claims 20, 21 depend from allowable claim 18, claims 31-33 depend from allowable claim 30, claims 38 and 42-44 depend from allowable claim 37, and claims 52-54 depend from allowable claim 51. In a telephone conference with Edouard Garcia (undersigned) on February 21, 2007, the Examiner said that the claims that depend from the indicated allowable claims also would be allowable if rewritten in independent form.

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For the reasons explained above, applicants will assume that the following claims are the claims that the Examiner intended to reject over Schildkraut: 1-8, 14-17, 23-29, 34-36, 46-50, 55, 58-60, and 64-68.

A.   Independent claim 1

Independent claim 1 has been amended and now recites:

1.   A method of processing an input image, comprising:

sub-sampling the input image to generate a thumbnail image comprising a reduced-size version of the input image in its entirety; and

detecting redeye pixel areas in the thumbnail image.

Support for this amendment can be found, for example, in FIG. 1 and on page 7, lines 1-15. In particular, with reference to FIG. 3, the specification discloses that "the input image 12 is sub-sampled to generate a thumbnail image (step 42)" (page 7, lines 3-4). FIG. 3 shows that the thumbnail image 44 comprises a reduced-size version of the input image in its entirety.[1] In addition, in accordance with their ordinary and accustomed meanings in the art of image processing, the term "thumbnail" means a reduced-sized version of an image (see, e.g., Merriam-Webster's Collegiate® Dictionary, Eleventh Edition (<<http://www.m-w.com/dictionary/thumbnail>>)) and the term "sub-sampling" means producing a reduced-size version of an image. For example, as explained in the portion of the "HyperMedia Image Processing Reference" that is listed in the attached Form PTO-1449, subsampling is a well-known term in the art of image processing that refers to an image reduction process that "is performed by replacement (of a group of pixel values by one arbitrarily chosen pixel value from within this group) or by *interpolating* between pixel values in a local neighbourhoods" (see page 3, lines 2-4 of the section entitled "Brief Description". On page 3 of this reference, the section entitled "How It Works" describes two methods of sub-sampling an image, where each method produces a reduced-size version of the original image.

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1 It is well settled that drawings alone are sufficient to satisfy the written description requirement under 35 U.S.C. § 112. For example, MPEP § 2163 II.A.3(a) explains that:

An applicant may show possession of an invention by disclosure of drawings or structural chemical formulas that are sufficiently detailed to show that applicant was in possession of the claimed invention as a whole. See, e.g., Vas-Cath, 935 F.2d at 1565, 19 USPQ2d at 1118 ("drawings alone may provide a 'written description' of an invention as required by Sec. 112")...

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In the rejection of independent claim 1, the Examiner has taken the position that the sub-color-image (which is cut-out from the input image 10 in accordance with one of the skin sub-maps that was cut-out from the skin map shown in FIG. 4) corresponds to the thumbnail image recited in claim 1. This sub-color-image, however, does not include "a reduced-size version of the input image in its entirety," as now recited in independent claim 1. Instead, the sub-color-image contains only part of the input image 10 that contains skin color (see col. 4, lines 1-12, and col. 5, lines 4-6).

For at least this reason, the Examiner's rejection of independent claim 1 under 35 U.S.C. § 102(e) over Schildkraut now should be withdrawn.

B.   Claims 2, 4, 5, 7, 8, 16, 17, 24, 25, 47, and 48

Each of claims 2, 4, 5, 7, 8, 16, 17, 24, 25, 47, 48 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above.

C.   Claim 3

Claim 3 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above. Claim 3 also is patentable over Schildkraut for the following additional reasons.

Claim 3 recites that "pixel redness measures are computed based on a ratio of a measure of a red component of pixel energy to a measure of total pixel energy." The Examiner has taken the position that Schildkraut discloses this feature of claim 3 in col. 4, lines 13-65 and col. 6, lines 3-55. The cited parts of Schildkraut, however, do not support the Examiner's position.

In col. 4, lines 13-65, Schildkraut discloses the process of determining those skin sub-maps that have an acceptable degree of fit to an ellipse with an acceptable aspect ratio (see, e.g., col. 4, lines 56-57) and the process of computing a resize factor for resizing the sub-color-regions 40 (see col. 4, line 58 - col. 5, line 10). Nowhere in this disclosure does Schildkraut teach that pixel redness measures (which are used to identify a preliminary set of candidate redeye pixel areas) are computed based on a ratio of a measure of a red component of pixel energy to a measure of total pixel energy.

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In col. 6, lines 3-55, Schildkraut describes the process of generating a map of candidate redeye pixels for each sub-color-image by growing regions of continuous color from the identified candidate redeye pixels (see col. 6, lines 3-17) and determining whether candidate redeye pixels are part of an eye using a template-matching eye detection procedure (see col. 6, lines 23-38). Nowhere in this disclosure does Schildkraut teach that pixel redness measures (which are used to identify a preliminary set of candidate redeye pixel areas) are computed based on a ratio of a measure of a red component of pixel energy to a measure of total pixel energy.

The only "redness" measure that Schildkraut appears to use is the one that is defined by the code value equation presented in col. 5, line 29. This equation is used to compute the new signal band image S16a (see col. 5, lines 25-31). This equation, however, does not compute pixel redness measures "based on a ratio of a measure of a red component of pixel energy to a measure of total pixel energy," as recited in claim 3.

For at least these additional reasons, the Examiner's rejection of independent claim 3 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

D.   Claim 6

Claim 6 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above. Claim 6 also is patentable over Schildkraut for the following additional reasons.

Claim 6 recites that "detecting redeye pixel areas further comprises segmenting redeye pixels by scanning a redness map of the redness measures in stripes of one or more pixel lines and tracking objects containing candidate redeye pixels connected across stripes." The Examiner has taken the position that Schildkraut discloses this feature of claim 6 in col. 4, lines 5-13. The cited part of Schildkraut, however, does not support the Examiner's position.

In col. 4, lines 5-13, Schildkraut explains that the binary skin sub-maps are cut-out from the skin map shown in FIG. 4 and contain code values of 0 (black) in non-skin color areas and values of 255 (white) in skin color areas. This disclosure does not teach anything whatsoever about "scanning a redness map of the redness measures in stripes of one or more pixel lines and tracking objects containing candidate redeye pixels connected across stripes."

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For at least these additional reasons, the Examiner's rejection of independent claim 6 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

E.   Claim 15

Claim 15 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above. Claim 15 also is patentable over Schildkraut for the following additional reasons.

Claim 15 recites "filtering candidate redeye pixel areas from the preliminary set based on proportions of detected skin tone pixels in regions respectively surrounding the candidate redeye pixels areas." The Examiner has taken the position that Schildkraut discloses this feature of claim 15 in FIG. 2, steps S8 and S16. The cited part of Schildkraut, however, does not support the Examiner's position.

Step 8 of FIG. 2 relates to the process of fitting skin regions to an ellipse to obtain an elliptical sub-image (see col. 4, lines 13-41). This process has nothing whatsoever to do with "filtering candidate redeye pixel areas from the preliminary set based on proportions of detected skin tone pixels in regions respectively surrounding the candidate redeye pixels areas." Indeed, in this stage of Schildkraut's process, candidate redeye pixel areas have not yet been identified; consequently, there is no "preliminary set" from which candidate redeye pixel areas can be filtered.

Step 16 of FIG. 2 relates to the process of generating a map of candidate redeye pixels for each sub-color region (see col. 5, line 21 - col. 6, line 17). This stage of Schildkraut's process does not involve filtering candidate redeye pixel areas from a preliminary set. Instead, these candidate redeye pixel areas are identified based on MinSize and MaxSzie thresholds. In accordance with Schildkraut's teachings, these candidate redeye pixel areas are confirmed during the eye detection process (see step S20 in FIG. 2, col. 6, lines 23-25, and col. 9, lines 60-65). The resulting candidate redeye pixel areas also are confirmed based on the final score P (step S26), the position of the red eye pairs in the color image (S28), and consistency (step S30). None of these confirmation steps, however, involves "filtering candidate redeye pixel areas from the preliminary set based on proportions of detected skin tone pixels in regions respectively surrounding the candidate redeye pixels areas," as recited in claim 1.

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For at least these additional reasons, the Examiner's rejection of independent claim 15 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

F.   Claim 23

Claim 23 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above. Claim 23 also is patentable over Schildkraut for the following additional reasons.

Claim 23 recites "detecting redeye pixel areas in the input image, and generating a set of detected redeye pixel areas by merging redeye pixel areas detected in the input image with redeye pixel areas detected in the thumbnail image." The Examiner has taken the position that Schildkraut discloses these features of claim 23 in col. 3, lines 52-66. The cited part of Schildkraut, however, does not support the Examiner's position. In col. 3, lines 52-66, Schildkraut discloses the process of generating a map of the skin colored regions in the input image 10. At this point in Schildkraut's process, the areas of the input image corresponding to faces have not even been detected yet. Therefore, this disclosure hardly could disclose "detecting redeye pixel areas in the thumbnail image; detecting redeye pixel areas in the input image; and generating a set of detected redeye pixel areas by merging redeye pixel areas detected in the input image with redeye pixel areas detected in the thumbnail image."

It is noted that the remainder of Schildkraut's disclosure up to step S28 describes the process of detecting redeye pixel areas in each sub-color-image, which the Examiner has stated constitutes a thumbnail image. The final steps (S28 and S30) of Schildkraut's process determine the positions of the redeye pixel areas in the input image 10. Schildkraut, however, does not even hint that his process separately detects redeye pixel areas in the input image 10 and then merges those redeye pixel areas with the redeye pixel areas detected in the sub-color-images, as proposed by the Examiner.

For at least these additional reasons, the Examiner's rejection of independent claim 23 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

G.   Claim 26

Claim 26 incorporates the features of independent claim 1 and therefore is patentable over Schildkraut for at least the same reasons explained above. Claim 26 also is patentable over Schildkraut for the following additional reasons.

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Claim 26 recites "correcting redeye comprises enlarging redeye pixel areas mapped to the input image." The Examiner has taken the position that Schildkraut discloses this feature of claim 26 in col. 3, lines 52-66. The cited part of Schildkraut, however, does not support the Examiner's position. In col. 3, lines 52-66, Schildkraut discloses the process of generating a map of the skin colored regions in the input image 10. At this point in Schildkraut's process, the areas of the input image corresponding to faces have not even been detected yet. Therefore, this disclosure hardly could disclose "correcting redeye in the input image based on redeye pixel areas detected in the thumbnail image, wherein correcting redeye comprises mapping the detected redeye pixel areas to the input image and enlarging redeye pixel areas mapped to the input image."

It is noted that Schildkraut's disclosure ends at the point when the final position of the redeye pairs have been identified (see the output of step S30 in FIG. 2). Schildkraut does not appear teach anything about correcting the identified redeye pairs, much less anything about "correcting redeye comprises mapping the detected redeye pixel areas to the input image and enlarging redeye pixel areas mapped to the input image."

For at least these additional reasons, the Examiner's rejection of independent claim 26 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

H.   Claims 27, 28, 34-36, and 46

Each of claims 27, 28, 34-36, and 46 incorporates the features of independent claim 26 and therefore is patentable over Schildkraut for at least the same reasons explained above.

I.   Independent claim 49

Independent claim 49 recites:

> 49.   A method of processing an input image having lines of pixels with original color values, comprising:
>
> detecting one or more redeye pixel areas corresponding to respective areas in the input image;
>
> classifying each pixel in the input image corresponding to the detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis without reference to pixels in adjacent lines; and
>
> correcting the original color values of pixels in the input image classified as redeye pixels.

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The Examiner has taken the position that Schildkraut discloses the "classifying" element of claim 49 in col. 1, lines 44-48, col. 2, lines 32-39, col. 5, line 58 - col. 6, lines 9, col. 9, line 66 - col. 10, line 60. The cited part of Schildkraut, however, does not support the Examiner's position.

In col. 1, lines 44-48, Schildkraut discloses "(a) detecting skin colored regions in a digital image; (b) searching the skin colored regions for groups of pixels with color characteristic of redeye defect; and (c) correcting color of the pixels based on a location of redeye defect found in step (b)." This disclosure does not teach "classifying each pixel in the input image corresponding to the detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis without reference to pixels in adjacent lines," as recited in claim 1.

In col. 2, lines 32-39, Schildkraut discloses:

> Referring to FIG. 2, there is illustrated an overview flowchart of the present invention. A color digital image is input to the software program residing on a computer system, such computer systems being well known in the art. The code values of the digital image are preferably proportional to the log of the amount of exposure of the film used to capture the image by the original scene S2. The program begins by identifying all separate continuous skin colored regions in the image S4.

This disclosure also does not teach "classifying each pixel in the input image corresponding to the detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis without reference to pixels in adjacent lines," as recited in claim 1.

In col. 5, line 58 - col. 6, line 9, Schildkraut discloses:

> For each pixel in the smoothed residual image, a 7 × 7 window centered at that pixel is examined. If the code value of that pixel exceeds the threshold Tpeak which is set equal to 5 and is greater than or equal to the code value of all the other pixels in the window, that pixel is classified as a peak S16f. FIG. 10 shows the peaks 37 for all of the sub-color-images in FIG. 7. After all the peaks in the smoothed residual image have been found the individual peaks are examined S16g. First, if a pixel has been classified as a peak and a neighboring pixel that is west, north-west, north, or north-east of this pixel has also been classified as a peak, the peak is eliminated S16h.
>
> A pixel that has been classified as a peak is a candidate redeye pixel. It is possible however that the location of the peak

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coincides with glint in the pupil and not the red defect. For this
reason, pixels within a distance GlintRadius equal to 2 from the
peak are examined S16i. The candidate redeye pixel is moved
to the nearby pixel with the highest color score P_{color} which will
be defined below.

This disclosure also does not teach "classifying each pixel in the input image corresponding
to the detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line
basis without reference to pixels in adjacent lines," as recited in claim 1. Indeed, the use of a
7×7 window inherently teaches away from classifying "on a line-by-line basis without
reference to pixels in adjacent lines."

In col. 9, line 66 - col. 10, line 60, Schildkraut discloses the process of locating the
final position of redeye areas in the input image (referred to below as "the cited process").

The cited process involves checking the symmetry of the color sub-image about the
mid-point of the best pair of redeye pixels (see col. 10, lines 1-45; step S24 in FIG. 2). The
symmetry checking process, however, does not involve "classifying each pixel in the input
image corresponding to the detected redeye pixel areas as a redeye pixel or a non-redeye
pixel on a line-by-line basis without reference to pixels in adjacent lines," as recited in claim
1.

The cited process also involves determining the position of redeye pairs in the color
image (see col. 10, lines 47-60; step S28 in FIG. 2). The position determining process,
however, does not involve "classifying each pixel in the input image corresponding to the
detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis
without reference to pixels in adjacent lines," as recited in claim 1. Instead, the positioning
determining process involves determining the positions of candidate redeye pixels in the
input image from the coordinates of the best pair of redeye pixels. In light of Schildkraut's
silence on the matter, the rest of the redeye pixels in the input image 10 presumably are
identified from their correspondence with the redeye pixels that were identified in the
corresponding sub-color-images based on the seed growing process described in col. 6, lines
10-15.[2]

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[2] It is noted that Schildkraut does not even hint that the seed growing process described in col.
6, lines 10-15 involves "classifying each pixel in the input image corresponding to the
detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis
without reference to pixels in adjacent lines."

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The cited process also involves checking consistency (see col. 10, line 61 - col. 11, line 3; step S30 in Fig. 2). The consistency checking process, however, does not involve "classifying each pixel in the input image corresponding to the detected redeye pixel areas as a redeye pixel or a non-redeye pixel on a line-by-line basis without reference to pixels in adjacent lines," as recited in claim 1.

For at least these reasons, the Examiner's rejection of independent claim 49 under 35 U.S.C. § 102(e) over Schildkraut should be withdrawn.

J. Claim 50

Claim 50 depends from independent claim 49 and therefore is patentable over Schildkraut for at least the same reasons explained above.

K. Independent claim 58

Independent claim 58 has been amended and now recites features that essentially track the pertinent features of independent claim 1 discussed above. Therefore, independent claim 58 is patentable over Schildkraut for at least the same reasons explained above in connection with independent claim 1.

L. Claims 59, 60, and 64-67

Each of claims 59, 60, and 64-67 depends from independent claim 58 and therefore is patentable over Schildkraut for at least the same reasons explained above.

M. Independent claim 68

Independent claim 68 recites features that essentially track the pertinent features of independent claim 49 discussed above. Therefore, independent claim 68 is patentable over Schildkraut for at least the same reasons explained above in connection with independent claim 49.

IV. Conclusion

For the reasons explained above, all of the pending claims are now in condition for allowance and should be allowed.

Charge any excess fees or apply any credits to Deposit Account No. 08-2025.

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Respectfully submitted,

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